ATTACHMENT 2 April 12, 2007

Subject: Report of Water Availability From Coyote Creek, Northern Borrego Valley for the Borrego Valley Replenishment Project

PURPOSE

The purpose of this summary of water availability from Coyote Creek is for analysis by the State Water Resources Control Board, Division of Water Rights in there assessment of an application to appropriate surface water. To my knowledge, there are no permits to appropriate water from Coyote Creek nor applications to appropriate Coyote Creek surface flow.

BACKGROUND

According to the United States Geological Survey (USGS, 1982), groundwater is being extracted from Borrego Valley at rates greater than recharge. The result has been a lowering of groundwater levels of varying rates in various parts of the Borrego Valley. Accordingly, the San Diego County Department of Land Use Planning (DPLU policy-Section B(1)) states *"Applicants for projects using groundwater resources in Borrego Valley are encouraged to include with their projects, offsetting groundwater use reduction measures which will make up for the project's proposed groundwater use and result in "no net gain" in the overall rate or amount of extraction of groundwater."* Therefore, proposed water usage should not contribute to the existing "overdraft" conditions. The policy encourages planners to reduce the water usage by an amount equal to the project needs.

Petra prepared a letter-report entitled "Task 1 - To Assess Feasibility of Off-Setting Groundwater Use Reduction For the Proposed Yaqui Pass and Viking Ranch Residential Developments, Borrego Valley, California," dated March 30, 2005. Task 1 consisted of developing a preliminary water balance for the proposed project to address the San Diego County Department of Land Use policies. The letter-report considered the net effect of removing citrus from the Viking Ranch with estimated water use for proposed residential development. In addition, the project water balance considered the potential to add to the groundwater supply, the diversion of surface run-off of Coyote Creek to groundwater storage.

Coyote Creek enters the project site along the north boundary of Section 4, T10S, R6E San Bernardino Baseline and Meridian. Since that time no development on the Viking Ranch project is no longer in consideration. The Viking Ranch property is to be exclusively dedicated to groundwater recharge.

It is proposed to divert a portion of Coyote Creek surface flow to groundwater storage, that is currently lost as a potable supply both by evaporation during flow and mixing with salt laden sediments and evaporation at the Borrego Sink. The purpose of this summary is to provide information in support of the diversion of Coyote Creek flow to groundwater storage. The groundwater in storage will be used by the Borrego Water District (BWD) within their service area and withdrawn from wells ID4-3, ID4-4, and ID4-18. The location of the Viking Ranch, the BWD wells, and service area. Is shown on Figure 1A and Figure 1B. The following sections provide additional information with regards to potential water availability from Coyote Creek.

THE COYOTE CREEK DIVERSION TO GROUNDWATER STORAGE PROJECT

The Coyote Creek Diversion to Groundwater Storage Project involves the construction of a concrete diversion structure within the Coyote Creek channel near the northeast corner of the northwest quarter of the southwest quarter of Section 4, Township 10 South, Range 6 East, San Bernardino Base and Meridian, and the construction of groundwater recharge basins within the south half of said Section 4, for the diversion and percolation of Coyote Creek flows to groundwater storage in lieu of the flows continuing to a salt sink. The location of recharge basins are shown on Figure 1A and Figure 1B. The following sections provide an estimated water balance and discussion of potential surface water diversion to groundwater storage

Coyote Creek Surface Flow Originating North of Viking Ranch

The surface flow originating north of Viking Ranch consists of run-off from Coyote Creek and run-off from other tributary drainages entering Coyote Creek downstream of the former

U.S.G.S. gauging station. Surface flow is lost to percolation in the reach in coarse grained surface sediments located primarily in the reach north of Viking Ranch. The remaing flow continues through or around Viking Ranch downstream with subsequent mixing and evaporation at the Borrego sink. The following sections provide preliminary data on the items of the surface flow.

Surface Inflow

Coyote Creek Surface Flow.

According to the USGS (1982), most of the stream flow occurs as intermittent run-off in the winter. Measurements of surface water run-off from a gauge located on Coyote Creek (USGS Gauge Number 10255800) is provided for the years 1951 through 1982 by the USGS (1982). Additional data for the years 1981-1983 is available from the USGS website for a total of 33 years of data. It is our understanding that the run-off gauge is not in an operable condition having been washed out by floods during the 1980s. USGS personnel indicate that there is currently no plan by the USGS to re-construct the gauge since the gauge is difficult to maintain due to site conditions.

The former gauge was located approximately 4.7 miles northwest of the project site. The measurements indicate that surface run-off ranged from a low of 320 acre-feet per year (A-F/yr) in 1976 to 10,772 A-F/yr. in 1980. The average annual surface run-off between 1951 and 1983 was calculated by Petra to be 1,834 A-F. Appendix A provides a tabulation of USGS mean daily flow stream gauge data.

Other Surface Flow to Coyote Creek Below the Former Gauging Station

Coyote Mountain

The drainage area for tributary drainages located on the south slope of Coyote Mountain is a total of seven square miles. Run-off from these drainages is not accounted for in the Coyote Creek stream flow data since the run-off occurs downstream of the former gauging station. The drainages contribute to the eastern channel of Coyote Creek which runs along the base

of Coyote Mountain. The drainage area ranges in elevation from 800 feet to 3,000 feet above mean sea level in steep terrain with sparce vegetation cover. Potential surface run-off from these drainages was calculated as follows: The average annual precipitation is 6.43 inches per year for Borrego Valley. This yields a water crop of 2,374 A-F for the drainage area. Using a very approximate run-off to surface drainage area from Coyote Creek (Run-off at an average of 1,834 A-F and basin area of 144 square miles = 12.74 A-F per square mile of drainage area). The average run-off from these drainages is anticipated to be approximately 89 A-F. It is anticipated that run-off from the Coyote Mountain described above, will continue downstream in the eastern channel of Coyote Creek, bypassing the point of diversion, to be used for downstream habitat and is therefore not considered as a part of the proposed diversion.

Unnamed Drainages on West Side of Coyote Creek

Two unnamed drainages contribute run-off to Coyote Creek below the area of the former gauging station. Run-off from these drainages is not accounted for in the Coyote Creek stream flow data since the run-off occurs downstream of the former gauging station. The drainages are contiguous and have drainages areas of 1,900 acres and 760 acres respectively or a combined 2,660 acres. The drainages contribute to the western channel of Coyote Creek. The larger drainage ranges in elevation from 1000 feet to 4,000 feet above sea level and has an estimated annual precipitation of 9.25 inches. The smaller drainage occupies land that ranges in elevation from 1000 feet to 2,800 feet above sea level and has an estimated precipitation of 8.3 inches per year. The total water crop for the two drainages combined is approximately 2,000 A-F. The run-off from the two drainages combined was estimated to be about 53 A-F per year using the Coyote Creek rainfall-run-off relationship described above.

Surface Outflow

Surface Infiltration

Coyote Creek surface run-off infiltrates into the bed of Coyote Creek as it flows southeastward towards the Borrego Sink. Actual measurements of Coyote Creek bed infiltration have not

been obtained in previous studies. Viking Ranch is located about 4.7 miles downstream of the former gauging station. Using data published in Geological Survey Water-Supply Paper 1618, "A Use of Ground-Water Reservoirs for Storage of Surface Water in the San Joaquin Valley California", provided in Appendix B, and based upon the conditions and soil profile of Coyote Creek, the channel loss from the U.S.G.S. gaging station to the proposed diversion structure is estimated to be on average 0.80 cfs./mile or 3.8 cfs. for the reach (or approximately 1303 A-F/yr on average over the 33 year period).

Potential Surface Water Capture Volumes

Coyote Creek surface water run-off capture will occur during winter storm run-off and will be for those surface flows that cross the northern boundary of the Viking Ranch in the central channel of Coyote Creek. The volume of water that can be captured will be a function of the capacity of the collection system to be constructed on the central channel of Coyote Creek and the recharge rate of the proposed infiltration basins. The potential capture volumes are discussed in the section below entitled "Diversion to Groundwater Storage." Flows in the eastern channel will not be affected by the diversion.

Using the daily flow measurement data of the U.S.G.S., Coyote Creek near Borrego Springs, California, (Appendix A), and reducing the mean daily flows by 3.8 cfs. for channel loss prior to reaching the diversion structure, the residual, limited by the infiltration rate and storage of the recharge basins and the diversion capacity of the structure, would be diverted to groundwater storage.

The southwest quarter and a portion of the southeast quarter of Section 4, Township 10 South, Range 6 East, San Bernardino Base and Meridian would be developed into a series of groundwater recharge basins and provide approximately 150 acres of infiltration area.

The recharge basin area overlies the "upper aquifer" as defined by the U.S.G.S. (U.S.G.S., 1982). The relationship of the recharge area to the boundaries of the water bearing surface area of the Borrego Valley is shown on Figure 2A. Figure 2A is a reproduction of Plate 1 of U.S.G.S. Open File Report 82-855. The relationship of the recharge area to the underlying aquifer is shown on Figure 2B. Figure 2B is a reproduction of Plate 4 of the U.S.G.S. Open File Report 82-855. Cross-Section B-B' on Figure 2B shows the recharge areas overlying the aquifer.

Using an average infiltration rate for a site area of 150 acres of 1.0 acre-foot per acre per day for the initial 20 days of diversion and 0.5 acre-feet per acre per day thereafter, as set forth in Figure 5 of Appendix C. "Typical Curves of Infiltration Rates from Ponds in the Minter Field Area" of Geological Survey Water-Supply Paper 1618, refer to Appendix C, the maximum mean daily infiltration rate of all the recharge basins would be 75 cfs. for 20 days and 37.5 cfs. thereafter, without consideration of storage in the recharge basins.

Diversion to Groundwater Storage

An operation study of the 33 years (1951 through 1983) of U.S.G.S. records has been provided as Appendix D, "Coyote Creek Diversion to Groundwater Storage." A summary of the monthly and annual diversions are provided in Table 1, "Coyote Creek, Diversion to Groundwater Storage in acre feet" provided at the back of Appendix D. Based upon the above detailed criteria and the U.S.G.S. records, the expected average annual diversion of Coyote Creek flows to groundwater storage would be **307** acre-feet. Based on Table 1 data (1951-1983, USGS records), annual maximum diversion to groundwater storage of **2,591 A-F** might be anticipated from Coyote Creek. According to the design engineer, the diversion structure would include two 36" pipelines, East and West, for discharge to groundwater recharge basins of up to 75 cfs. with the remainder being allowed to bypass the collection structure and continue

toward the Borrego Sink. After capture and infiltration, approximately 366 A-F will continue downstream. Surface flows I the reach downstream of Viking Ranch will likely occur only during periodic large storms.

REFERENCE LIST

SAN DIEGO COUNTY,(undated), "DPLU Policy Regarding CEQA Cumulative Impact Analyses For Borrego Valley Groundwater Use."

UNITED STATES GEOLOGICAL SURVEY, (1970), "Mean Annual Runoff as Related to Channel Geometry of Selected Streams in California," Geological Water Supply Paper 1999-E.

UNITED STATES GEOLOGICAL SURVEY, (1982), "Water Resources of Borrego Valley and Vicinity, California, Phase 1–Definition of Geologic and Hydrologic Characteristics of Basin," Open File Report 82-855."

UNITED STATES GEOLOGICAL SURVEY, (1987), Water Resources of Borrego Valley and Vicinity, San Diego County, California: Phase 2–Development of a Ground-Water Flow Model," Water-Resources Investigation Report 87-4199.

UNITED STATES GEOLOGICAL SURVEY, (1975), "Geologic Map of the Clark Lake Quadrangle, San Diego County, California.

UNITED STATES GEOLOGICAL SURVEY, (1959), Borrego Sink Quadrangle California-San Diego Co, 7.5 Minute Series (Topographic)

UNITED STATES GEOLOGICAL SURVEY, (1959), Clark Lake Quadrangle California-San Diego Co, 7.5 Minute Series (Topographic)

UNITED STATES GEOLOGICAL SURVEY, (1959), Borrego Palm Canyon Quadrangle California-San Diego Co, 7.5 Minute Series (Topographic).